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RESEARCH ARTICLE

New and noteworthy records of saproxylic beetles (Coleoptera) from Crete (Greece)

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Abstract

Saproxylic beetles are in the spotlight of conservation biology. Crete (Greece) constitutes a special biogeographical entity and an endemism hotspot for many organisms. Despite its poor forest coverage and the continuous degradation of Cretan forests by human activities, Crete hosts an impressive assemblage of saproxylic Coleoptera, some of them being endemic of the island or/and threatened under the I.U.C.N. criteria. Herein we present new data regarding several saproxylic Coleoptera species of Crete, reporting the first records of five species for the Cretan entomofauna [*Calais parreysii* (Steven, 1829), *Dorcus parallelipipedus* (Linnaeus, 1758), *Dorcus peyronis* Reiche and Saulcy, 1856, *Platypus cylindrus* (Fabricius, 1792) and *Echinocerus floralis* (Pallas, 1773)].

Keywords

Buprestidae, Cerambycidae, Elateridae, Lucanidae, Scarabaeidae, threatened species, I.U.C.N., Cretan endemics.

Introduction

The island of Crete, has been isolated from nearby mainlands (Greece and Asia Minor) and major Aegean islands for more than 5 million years (Poulakakis et al.

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2014; Fassoulas 2018). The turbulent geological and climatic history of Crete has given birth to a remarkable diversity in all possible biological levels. Crete is recognized as an endemism hot-spot and a special biogeographical entity for various Coleoptera families (Mühle et al. 2000; Vitali and Schmitt 2016; Assing 2019), but also for other taxa, a property recognized during the early days of coleopterological research in Greek territory by v. Oertzen (1886). Nevertheless, in spite of being visited by both professional and amateur entomologists for almost 200 years (Anastasiou et al. 2018), many insect groups are not adequately studied. A lot of relatively recently discovered taxa are still known only from their "Locus Typicus". Faunistic research in Crete can contribute to three aspects: 1) It will expand our knowledge for certain relatively unknown Cretan endemics, especially when it comes to their distribution in the island. This could improve the assessment of the threats to these species, in view of the predominant use, in the case of arthropods, of criterion B in IUCN red list assessments. (Cardoso et al. 2011). 2) Recording novel species for the Cretan fauna will expand our biogeographical knowledge, given Crete's key position, in the middle of three continents (Europe, Africa, Asia). 3) At the island scale, it will contribute to obtain a clearer image of the historical connections among certain prominent elements such as the mountains.

Saproxylic beetles have been the focus of entomological research for some years now, especially under conservation perspectives (Cálix et al. 2018; García et al. 2018). In spite of biodiversity and conservation work, the research in Crete about saproxylic beetles is rather limited (Bolanakis and Trichas 2018). Most of the available information for the Cretan saproxylic beetles derives either from faunistic works of professional and amateur entomologists exploring prominent saproxylic families such Cerambycidae and Buprestidae or under the scope of wider evaluation projects like the Red list assessments of the saproxylic Coleoptera by the I.U.C.N.. In this work, we present new records and interesting findings concerning some saproxylic beetle families of Crete and closely related species. Most records originate from 35 years of samplings by the Natural History Museum of Crete (N.H.M.C.) research staff, plus various collaborations with international researchers throughout the above time-period. The species presented thereafter, are documented for a first time on the island (*Calais parreysii*, *Dorcus parallelipipedus, Dorcus peyronis, Platypus cylindrus, Echinocerus floralis*) or they are of great conservation importance.

Methods and Materials

Most of the species in the present study were collected with pitfall traps active between the years 1988 and 2019. As many as 15 (9.5 cm of diameter, 12 cm of depth) traps per site were distributed in straight line placements, along more than 150 m of homogenous vegetation patches. A minimum distance of 8 m between traps was kept. The traps were filled up with ethylene glycol or undiluted propylene glycol as a killing/preserving agent (Trichas et al. 2008; Kaltsas et al. 2013). Occasionally,

a small quantity of attractants like vinegar, or surface tension reducers like liquid soap, were used. Large stones to prevent/minimize both flooding and damage from grazing animals (exclusively sheep and goat flocks on Crete) were always placed above the plastic traps. The traps were sampled bi-monthly (as described in Kaltsas and Simaiakis 2012). They were active year-round; however, in several study sites, there was an overlap of the first two months in the next year. Thus, the traps were active 14 months in total. Hence, the samples were collected six or seven times per 12 or 14 months, except at elevations above 1500 m on the mountains, which were covered by snow from November till late April. These sampling stations were inactive for that period and usually produced three samples per year. Pitfall traps are not preferable for sampling saproxylic beetles, yet mostly by chance, saproxylic species dwelling close to the ground were captured (e.g., *Dorcus peyronis*). Complementary to the pitfall traps, during the years 2018 – 2019 we also incorporated fermenting traps, aiming for a wider sampling of the Cretan saproxylic fauna. The fermenting traps were constructed from plastic bottles (1.5 L), and had their bottom filled with ethylene glycol or undiluted propylene glycol along with vinegar as attractant. The bottles were hanged on trees, placed in various ecotopes: forests (dehesa like forests, stream forests, gorges), as well as wetlands and montane shrublands. The fermenting traps were essentially active for one year, with frequent samplings (one and half to two months), thus capturing a whole year of saproxylic activity.

Regarding the species' threat status, we adopted the recent I.U.C.N. assessment categories of the European Saproxylic fauna (Cálix et al. 2018).

Results

A. New Records for Crete

Elateridae

Calais parreysii (Steven, 1829) (Fig. 1A)

New Records: Chania**:** Anopoli village, Sfakia, Chania in *Cupressus* logs (35.23170; 24.08240), 10 ind., 24.V.015, leg. Ch. Makris (N.H.M.C.). Lassithi: Prina, Lassithi in pine forest (35.10670; 25.69250), 1 ind., 12.VI.2019, leg. G. Bolanakis (N.H.M.C.).

Distribution: Afghanistan, Albania, Cyprus, Croatia, Greece, Iran, Montenegro, Ukraine: Crimea (probably extinct), the Krasnodar region, Georgia, Syria, Anatolian Turkey (Cate 2007; Nardi et al. 2010; Platia 2011; B. Dodelin pers. com. 2023).

I.U.C.N. (Europe): NT

This large click-beetle has a fragmented distribution in the Eastern Mediterranean. It dwells in old pine trees (*Pinus* spp.) where the larvae pray upon various woodboring larvae of other Coleoptera, thus it is characterized as an obligatory saproxylic species (Nardi et al. 2010; Recalde and Zapata de la Vega 2017). In Greece it has

been mentioned as early as 1886, by von Oertzen, from Attica. Since then, it is only reported from few localities (Nardi et al. 2010, Recalde and Zapata de la Vega 2017), pointing out again to its rather fragmented distribution. *C. parreysii* has been also recorded recently from various localities, even outside mainland Greece, by citizen scientists (e.g., iNaturalist: Rhodes isl.). To our knowledge this is the first report of this species from the island of Crete and these new records are expanding the species extent of occurrence on a new zoogeographical subunit (Crete).

Specimens were collected from the major western and the major eastern mountain massifs of Crete (Lefka Ori and Dikti respectively). This distribution is not surprising, since old pine forests on Crete are spotted mainly in these two massifs (especially in their south slopes, Rackham and Moody 1996). This pattern has also been observed in other species associated with pine trees, like the endemic longhorn species *Pogonocherus creticus* Kratochvil 1985. The third major central massif (Psiloritis or Idi Mountain) could also host *C. parreysii,* since small patches of *P. brutia* are scattered on the west slopes of the mountain and pine-dwelling saproxylic beetles like

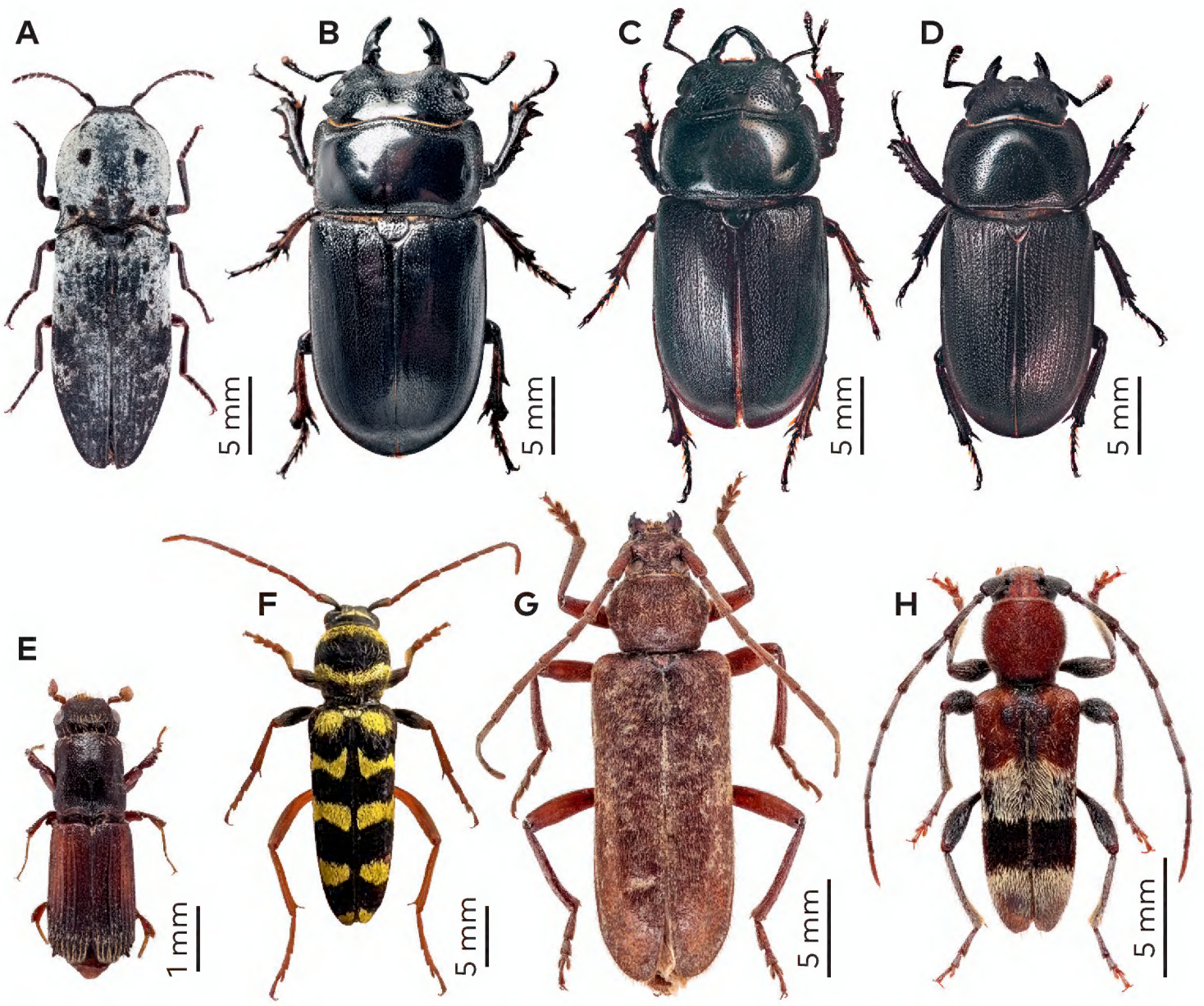

Figure 1. A *Calais parreysii*; **B** *Dorcus peyronis* male; **C** *Dorcus peyronis* female; **D** *Dorcus parallelipipedus*; **E** *Platypus cylindrus*; **F** *Echinocerus floralis*; **G** *Trichoferus bergeri;* **H** *Anaglyptus praecellens*.

Chalcophora detrita marani (Buprestidae) have also been reported from there (Mühle et al. 2000). These records could shed more light in the history of pine forests on the island, advocating to more continental saproxylic community assemblages. Finally, it must be underlined that the Elaterid fauna of Crete is not satisfactory known.

Lucanidae

Dorcus peyronis Reiche and Saulcy, 1856 (Fig. 1B, C)

New Records: Chania: Niato plateau, Lefka Ori, mountain shrubland with *Quercus coccifera*, *Acer* and *Crataegus* (35.29416; 24.14765), 7 ind., 20.IV.1991, leg. A. Trichas (N.H.M.C.). Rethymnon: Agios Yakynthos, Psiloritis (35.25790; 24.85630), 2 ind., 2.VII.2019, leg. G. Bolanakis (N.H.M.C.).

Distribution: Armenia, Azerbaijan, Bulgaria, Greece, Georgia, Iran, Israel, North Macedonia, Syria, Turkey, (Kováks and Merkl 2013; Bartolozzi et al. 2016b; Schenk 2022)

I.U.C.N. (Europe): DD

This rare Palearctic species is quoted from the Balkans in Greece, North Macedonia and Bulgaria (Baraud 1993; Bunalski et al. 2014; Bartolozzi et al. 2016a; Kováks and Merkl 2013). *D. peyronis* is a well-defined species, easily distinguishable from *D. parallelipipedus* by its larger size, the protruding/toothed expansions at the back-edges of the head and the external edge of the meso and metatibiae armed with two or three small teeth. It appears also, shinier and less punctured on the pronotum disc than *D. parallelipipedus.*

Apart from the very old record from Olympus mt. [only one specimen in Krüper's Collection in Athens (v. Oertzen 1886)], a few specimens and locations came to the authors' attention so far from Greece throughout the modern bibliography (three dead specimens were reported in Thessaly, three in Thrace and one on Olympus mt., Alexander et al. 2010). The same authors are also quoting Crete in the above assessment (without any further location details), but in the next I.U.C.N. assessment (Mediterranean) by Bartolozzi et al. 2017, this quotation was withdrawn. The rarity of this taxon in the Balkans is also underlined by Guéorguiev and Bunalski (2004), as the authors were being able to locate only a single female specimen of *D. peyronis* in the NMNHS and IZ collections in Sofia.

Herein we report location and habitat data for a first time, of two *D. peyronis* populations from Crete. Nine specimens were collected from two montane localities, one in Lefka Ori (1220 m a.s.l.) and one in Psiloritis mt. (1180 m a.s.l.). The novel localities have similar habitats, mainly shrubs of *Berberis cretica* and *Quercus coccifera* trees, along with other montane shrubland – dehesa elements (*Acer*, *Crataegus*). The specimens from Niato plateau (Lefka Ori) have been collected more than 30 years ago (1991). We visited again this plateau as well as adjacent sites and sampled the area with pitfall and fermenting traps without being able to find *D. peyronis* again. Therefore, we believe that extensive research focusing on the east side of Lefka Ori should be

carried out in order to confirm the presence or perhaps a possible extinction of the species in that area. Moreover, the affinity of the Cretan *D. peyronis* with the other Balkan (Greek mainland) or Anatolian populations of the species is obscure. Genetic data should be employed to clarify the origin of *D. peyronis* in Crete, shedding light to the island's biogeography.

Dorcus parallelipipedus (Linnaeus, 1758) (Fig. 1D)

New Records: Chania: Agya Lake (35.47500; 23.93460), 3 ind., 8.V.2017, leg. A. Amyntas (N.H.M.C.); same data but, 1 ind., 8.VI.2017; Kydoni gorge, in a riparian forest with *Platanus* sp. (35.40280; 23.91140), 1 ind., 25.IV.2018, leg. G. Bolanakis (N.H.M.C.); between Pefkias and Kyparissos peaks, Lefka Ori (35.35690; 23.86350), 1 ind., 31.V.2015, leg. Ch. Makris (N.H.M.C.); Psilo Kokkali peak, Lefka Ori (35.33790; 23.85240), 1 ind., 31.V.2015, leg. Ch. Makris (N.H.M.C.); Niato plateau, Lefka Ori, mountain shrubland with *Quercus coccifera*, *Acer* and *Crataegus* (35.29530; 24.14500), 2 ind., 20.IV.2019, leg. G. Bolanakis (N.H.M.C.). Rethymno**:** Diplori, Psiloritis (35.17160; 24.93780), 3 ind., 19.X.1999, leg. M. Nikolakakis (N.H.M.C.); Petres gorge, in a stream bank with *Platanus* and *Quercus* (35.33650; 24.36020), 1 ind., 31.V.2018, leg. N. Vlachopoulos (N.H.M.C.); same data but, 2 ind., 19.VII.2018, leg. G. Bolanakis (N.H.M.C.); Agios Yakynthos, Psiloritis (35.25790; 24.85630), 5 ind., 2.VII.2019, leg. G. Bolanakis (N.H.M.C.); Kastellos (35.29830; 24.43830), 3 ind., 3.VII.2019, leg. G. Bolanakis (N.H.M.C.); Rouvas, Psiloritis, in *Quercus coccifera – Platanus* forest by stream bank (35.16420; 24.91630), 15 ind., 2.VII.2019, leg. G. Bolanakis (N.H.M.C.); Lochria, in *Quercus coccifera* dehesa like forest (35.17640; 24.77780), 3 ind., 24.V.2019, leg. G. Bolanakis (N.H.M.C.). Heraklion**:** Omalos Viannou plateau, Dikti (35.06800; 25.44870), 2 ind., 23.VII.2015, leg. Ch. Pavlou (N.H.M.C.).

Distribution: The lesser stag beetle *Dorcus parallelipipedus* is distributed almost all over the Western Palaearctic; most of continental Europe and the larger Mediterranean islands of Corsica, Sardinia and Sicily (Stefanelli et al. 2014), west Asia up to western Siberia and Iran, and Northern Africa: Morocco (Bartolozzi et al. 2016b; Bartolozzi et al. 2016b).

I.U.C.N. (Europe): LC

In the Mediterranean area, *D. parallelipipedus* occupies mountain forested biotopes, but also lowlands. Lesser stag beetle records from the southern territories in the Eastern Mediterranean area (e.g., Peloponnese in Greece) or moreover, insular observations, are extremely rare, either due to the natural absence of the taxon or its rarity per se. The island of Crete was/is not included in the area of distribution in the recent relevant literature, while Red Data Lists and databases (I.U.C.N., Fauna Europaea, GBIF, etc.) do not list *D. parallelipipedus* on Crete. The old reference of v. Oertzen (1886) lists the taxon from "mainland Greece", Euboea and Crete. Moreover, one male *D. parallelipipedus* from Crete was reported recently in the very old Montandon Collection of the Romanian "Grigore Antipa" National Museum

of Natural History. This specimen is of an age similar to that of the specimen by v. Oertzen for Crete (Stan 2013).

To the authors' knowledge, no newer written references confirm *D. parallelipipedus* on Crete during the 20th century, until the "Citizen Science" in the last decade. Citizen science seems to expand significantly the occurrence *D. parallelipipedus* in Greece (including Crete). Our records establish the species' presence in several Cretan forests and sites with sapwood assemblages.

Platypodidae

Platypus cylindrus (Fabricius, 1792) (Fig. 1E)

New Records: Kydoni gorge, in a riparian site with *Platanus* sp. trees (35.40280; 23.91140), 2 ind., 31.VII.2019, leg. G. Bolanakis (N.H.M.C.)

Distribution: Turano-European-Mediterranean

I.U.C.N. (Europe): Not Evaluated.

Platypus cylindrus is the only species from the genus *Platypus* that is widely distributed in West Palaearctic. It is reported from Greece (Alonso-Zarazaga et al. 2017) and is very common in southern (Peloponnese) and western (Epirus) continental Greece (Soulioti et al. 2015). To our knowledge there are no records that specifically mention this species from Crete. *P. cylindrus* is an ambrosia beetle that bores galleries in the wood of its hosts, mainly oaks (Balachowsky *et al.* 1963). Its association with wood pathogenic fungi, has been central for many studies (Cassier et al. 1996; Sousa and Inácio 2005; Belhoucine et al. 2011; Inácio et al. 2011; Soulioti et al. 2015). Recently it has been highlighted by Soulioti et al. (2015) that *P. cylindrus* is very abundant in damaged plane trees (*Platanus orientalis*) throughout continental Greece. The ability of the beetle to carry and transmit the plane tree pathogen *Ceratocystis platani* has been investigated. The beetle would not transfer *C. platani* on healthy trees, but its ability to infect damaged, yet uninfected trees is a serious issue (Soulioti et al. 2015). We collected *P. cylindrus* in plane tree riparian sites where the Cretan endemic plane woodborer *Pedostrangalia ariadne* has also been collected (see below). This is alarming because one of the main threats listed for *P. ariadne* is the *C. platani* which has not yet been reported from Crete (Dodelin et al. 2017a). The dynamic between *P. cylindrus* and *C. platani* as described by Soulioti et al. (2015) change the situation about the presence of *C. platani* in Crete, with repercussions on *P. orientalis* forests and *P. ariadne* populations. Of course, we should mention that, by collecting the specimens via fermenting traps, we cannot be sure about the species' presence only on plane trees, since there were also other suitable hosts nearby (e.g. oak trees).

Cerambycidae

Echinocerus floralis (Pallas, 1773) (Fig. 1F)

New records: Heraklion: Knossos Avenue, in the area of old-University buildings (35.307566; 25.154149), 1 ind. 20.VI.2023, leg. P. Lymberakis (N.H.M.C.)

Distribution: West Palaearctic, reaching China.

I.U.C.N. (Europe): Not-Evaluated

Echinocerus floralis is a widespread species in West Palaearctic that exhibits significant intraspecific variability. Recently, Lazarev (2022) described a subspecies from continental Greece, *E. f. centaureus* Lazarev, 2022. Until now, only two species of *Plagionotus sensu lato* (*E. floralis* was also placed under the genus *Plagionotus* in the recent past) were known from Crete. *Plagionotus arcuatus* (widespread in the island with an endemic subspecies – *P. a. ghidottii* Pesarini and Sabbadini, 2011) and *Plagionotus detritus* (Linnaeus, 1758). The presence of the latter in the island needs reconfirmation since it is known only from a very old record (Oertzen 1886). It should be noted though that *E. floralis* is not a saproxylic species but develops in herbaceous plants (*Euphorbia, Medicago, Achillea*);. The record of *E. floralis* in Crete expands the southern limits of its distribution in Greece.

B. Species of Conservation Interest

Cerambycidae

Trichoferus bergeri Holzchuh, 1982 (Fig. 1G)

New records: Chania: Anopoli to Pachnes (Lefka Ori) (35.26870; 24.08730), 3 ind., 7.IX.1991, leg. P. Lymberakis (N.H.M.C.). Rethymno: Kastellos, in *Quercus macrolepis* thicket (35.31190; 24.41860), 1 ind., 3.VIII.2019, leg. G. Bolanakis (N.H.M.C.).

Distribution: Crete (Endemic)

I.U.C.N. (Europe): CR (Critically Endangered)

Although *T. bergeri* is reported from several locations along the island (Schedl 2013; Verdugo et al. 2016), it appears that its populations are heavily fragmented (Verdugo et al. 2016). Our finding in the area of Kastellos calls for further research in the valley between the provinces of Apokoronas and Rethymnis, that could unravel more populations, albeit most likely also fragmented.

Anaglyptus praecellens, Holzchuh, 1981 (Fig. 1H)

New records: Chania: Path to Kallergi refuge, Omalos plateau, Lefka Ori (35.31870; 23.92040), 9 ind., 20.VI.2019, leg. G. Bolanakis (N.H.M.C.); Omalos plateau, N slopes, in *Cupressus* thicket with *Berberis* (35.35230; 23.90490), 6 ind., 20.VI.2019, leg. G. Bolanakis (N.H.M.C.); Tavri plateau, Lefka Ori, mountain shrubland with

Quercus coccifera, *Acer* and *Crataegus* (35.30000; 24.16440), 6 ind., 20.VI.2019, leg. G. Bolanakis (N.H.M.C.); Niato plateau, Lefka Ori, mountain shrubland with *Quercus coccifera*, *Acer* and *Crataegus* (35.29530; 24.14500), 10 ind., 20.VI.2019, leg. G. Bolanakis (N.H.M.C.); same data but, (35.30040; 24.16390), 12 ind., 19.VII.2013 leg. S. Simaiakis (N.H.M.C.); Saridantoni (35.35790; 23.91520), 2 ind., 19.VII.2013 leg. S. Simaiakis (N.H.M.C.); Greleska, on the way to Agioi Theodoroi (35.32120; 23.85930), 1 ind., 19.VII.2013, leg. S. Simaiakis (N.H.M.C.); Therisso on the way to Kaloros (35.37800; 23.99220), 1 ind., 19.VII.2013, leg. S. Simaiakis (N.H.M.C.) Eastern plateau between Pyrgos and Mavres peaks, Omalos plateau (35.34060; 23.90830), 1 ind., 31.V.2015, leg. Ch. Makris (N.H.M.C.).

Distribution: Western Crete (Endemic).

IUCN(Europe): EN (Endangered)

This rare species is confined to the massif of Lefka Ori (Schedl 2013; Buse et al. 2016a). In the existing literature the species is reported only from its locus typicus (Omalos plateau Holzchuh 1981). Nevertheless, a locality in Anopolis (southeastern Lefka Ori) is given in Buse et al. (2016a). Our records in the southern east slopes of the massif clearly expand the extent of occurrence (EOO) and area of occupancy (AOO) of the species, indicating a fragmented population. The area that connects the two plateaus (Omalos and Askyfou) is very difficult to sample, but we judge such actions as mandatory in order to have a better image of the subpopulation structure of the species. The two new plateaus (Niato and Tavri) above Askyfou area where the species was recorded, are far smaller than the Omalos plateau, and although they are exploited via stock raising and apiculture (plus moderate touristic activities), they are way less exploited than Omalos area. In the I.U.C.N. assessment it is assumed that the species population is under decline due to agriculture (Buse et al. 2016a). These far more isolated plateaus could act as shelters for the species, although a more concrete examination of human impact in these novel locations should be carried out. Moreover, we expanded the AOO of the species around the Omalos plateau. We strongly suggest that an ecological and population study, utilizing molecular markers aimed at *Anaglyptus praecellens* could be a rather fine conservation case study of an arthropod species with restricted distribution.

Isotomus speciosus jarmilae Sláma, 1982

New Records: Rethymnon: Agios Titos, Psiloritis (35.18820; 24.75950), 2 ind., 18.VIII.1999, leg. M. Nikolakakis (N.H.M.C.)

Distribution: Crete (Endemic)

I.U.C.N. (Europe): EN (Endangered)

This endemic sub-species is distributed in West – Central Crete (Slama and Slámová1996; Schedl 2013; Buse et al. 2016b). The taxonomic status of *I. jarmilae* has recently changed with the above taxon being now regarded as a subspecies of *I. speciosus* (Rapuzzi and Sama 2018). A location east of Psiloritis mountain in the Temenos province and attributed to a specimen collected by M. Egger (in coll. Schedl)

(Buse et al. 2016b) must be commented on. Schedl (2013) reports the exact same specimen from Temenia, not Temenos. Temenia is located in the southern western Crete, west of the Lefka Ori massif, in Selino province. We assume Temenia is the correct locality, being confused with Temenos, since 1) it is reported from the owner of the collection where the species is deposited, 2) there are other records of the species nearby this area and 3) it is unlikely that a species with west-central distribution would surpass the massif of Psiloritis. Here we report one more new location, the eastern one till today, in Agios Titos, near Lochria village. This location is the first one in the mountain of Psiloritis. Further research in this mountain could unveil populations even in the eastern slopes of the massif and expand the species EOO.

Pedostrangalia ariadne K. Daniel, 1904 (Fig. 2A)

New Records: Chania: Kydoni gorge, in a riparian site with *Platanus* sp. (35.40280; 23.91140), 1 ind., 31.V.2018, leg. G. Bolanakis (N.H.M.C.); same data, but 16.V.2019. Heraklion: Omalos Viannou plateau, near a small doline with dehesa like forest of *Quercus coccifera* (35.068; 25.4719), 1 ind., 29.VII.2019, leg. G. Bolanakis (N.H.M.C.)

Distribution: Crete (Endemic).

I.U.C.N. (Europe): VU (Vulnerable)

P. ariadne is an obligate saproxylic species that develops in *Platanus* trees. We add two new localities for the species, expanding its EOO towards the west and east of the island. The western locality of Kydoni gorge is ideal for the species since plenty of veteran plane trees (*Platanus orientalis*) occur there, plus some old *Castanea sativa*, on whose flowers the adults feed (Sláma and Slámová 1996). Unfortunately, in the same locality, a potential carrier of *Ceratocystis platani* which is identified as a serious potential threat for the species (Dodelin et al. 2017a) was spotted (see above: *Platypus cylindrus*). The eastern locality is more peculiar, located in a mountain plateau near a small doline, with a dehesa like forest of *Quercus coccifera*.

Stictoleptura slamai (Sama, 2010) (Fig. 2B)

New Records: Chania: Anopolis (35.261099; 24.102031), 1 ind., 23.VI.1990, leg. A. Trichas (N.H.M.C.); Rethymnon: Lochria, in *Quercus coccifera* dehesa like forest (35.1764; 24.7778), 1 ind., 4.IV.2019, leg. G. Bolanakis (N.H.M.C.). Heraklion: Omalos Viannou plateau, near a small doline with dehesa like forest of *Quercus coccifera* (35.068; 25.4719), 1 ind., 12.VI.2019, leg. G. Bolanakis (N.H.M.C.).

Distribution: Crete (Endemic).

I.U.C.N. (Europe): DD (Data Deficient)

Stictoleptura slamai is an extremely rare species with less than ten reported specimens (Schedl 2013; Dodelin et al. 2017b). Here we add three new localities for the species expanding its range on most of the Cretan major massifs (Lefka Ori, Psiloritis and Dikti). Although rare, this species has a distribution wider than expected. Even more interesting is the contrast between the reported habitats. The locus typicus and

the locality of the paratypes are lowland areas with riparian groves, while the Lochria locality is an overgrazed shrubland with *Q. coccifera* and low growing shrubs. Omalos Viannou site, is a mixed forest of *Acer* and *Q. coccifera* surrounding a temporary pond. Finally, the location of Anopolis lays over 1500m of altitude, with only dwarf shrubs. This raises questions of habitat requirements of the species since Lochria is a rather dry shrubland while Elos and Omalos Viannou are more humid areas. Both in Lochria and Omalos Viannou the dominant type of tree is *Q. coccifera*, along with *Acer* and *Crataegus*. In both areas the *Q. coccifera* trees are old and large in size. Furthermore, the altitudinal range of the species is not restricted at all, starting from Voutas (250 m, Schedl 2013) to Anopolis (>1500 m).

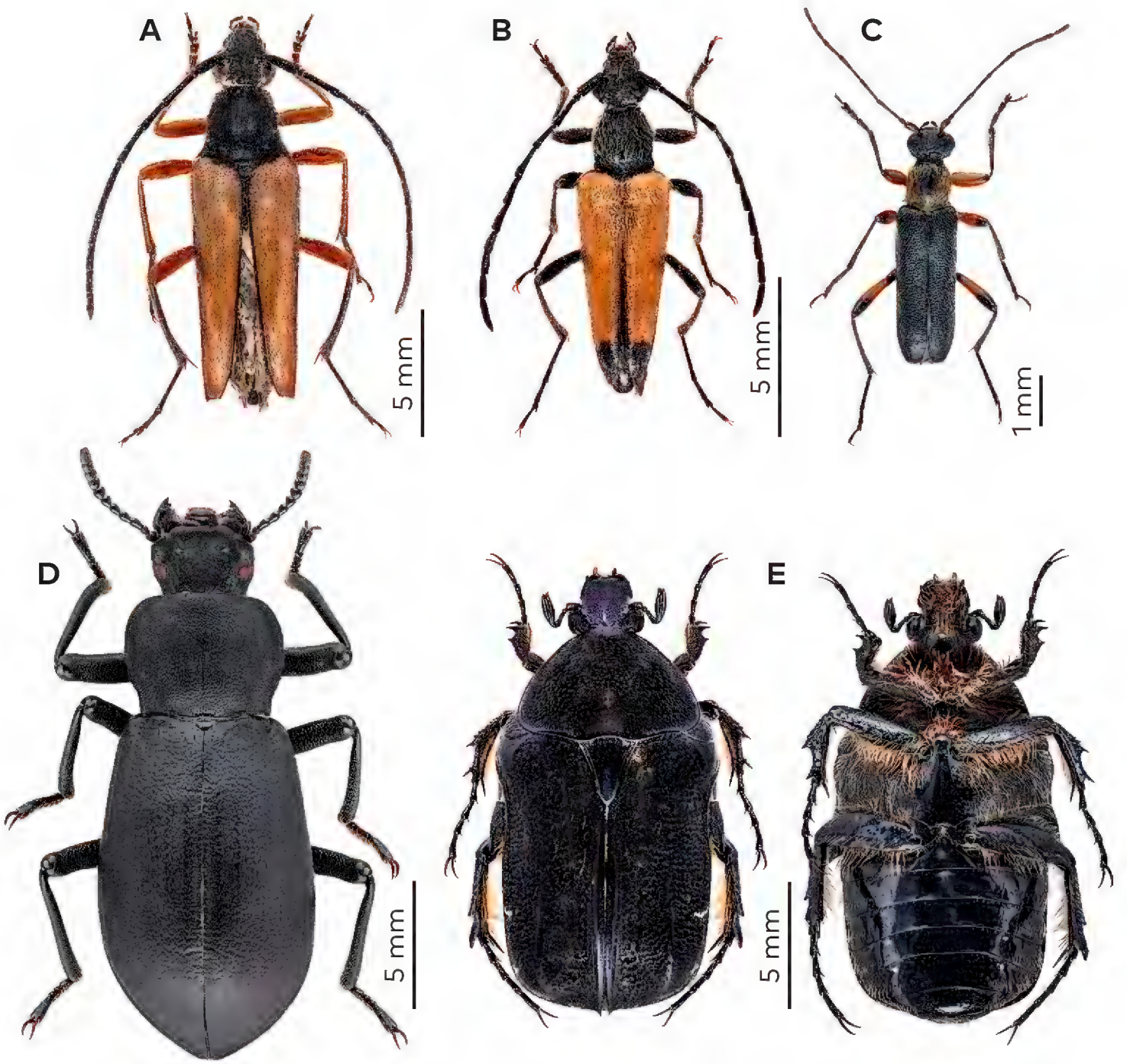

Figure 2. **A** *Pedostrangalia ariadne*; **B** *Stictoleptura slamai*; **C** *Grammoptera auricollis*; **D** *Iphthiminus bellardi*; **E** *Cetonia asiatica*.

Grammoptera auricollis Mulsant and Rey, 1863 (Fig. 2C)

New Records: Rethymnon Kastellos (35.2983; 24.418591), 1 ind., 31.V.2019, leg. G. Bolanakis (N.H.M.C.). Heraklion: Lochria village, in *Quercus coccifera* dehesa like forest (35.164233; 24.91633), 1 ind., 2.VII.2019, leg. G. Bolanakis (N.H.M.C.). Lassithi: Katharo plateau in *Quercus coccifera* forest (35.153513; 25.585858), 1 ind., 29.VII.2019, leg G. Bolanakis (N.H.M.C.); Lassithi plateau 35.1829; 25.4623), 1 ind., leg. P. Brandl (Collection P. B.).

Distribution: Greece, Algeria, Tunisia.

I.U.C.N. (Europe): NT (Near Threatened)

The species consists of four subspecies: *G. auricollis samai* Sláma, 1997 (Algeria, Tunisia), *G. a. auricollis* Mulsant and Rey, 1863 (Algeria), *G. a. basicornis* (Crete) Pic, 1924 and *G. a. bipustulata* Steiner, 1975 (continental Greece) (Danilevsky 2022). Although the Cretan subspecies could be of African origin, southward expansion from Peloponnese during the Pleistocene glaciation cannot be eliminated, even though Crete is not considered as a primary glacial refuge due to the great depths separating it from continental Greece (Poulakakis et al. 2014). Nevertheless, Crete is mentioned as a minor glacial refuge for Cerambycidae in Vitali and Schmitt (2016). Here, we expand the species distribution in the Cretan island which -to our knowledge- was until now restricted to western Crete (Schedl 2013): in the central and eastern major massifs of the island, Psiloritis (Lochria) and Dikti (Katharo, Lasithi plateau) respectively, plus Rethymnon (Kastellos) in the west.

Purpuricenus schurmanni (Sláma, 1985)

New Records: Chania: Tavri plateau, Lefka Ori (35.29930; 24.16000), 1 ind., 27.V.2015, leg. Ch. Makris (N.H.M.C.); Profitis Ilias, Lefka Ori (35.35980; 24.09900), 1 ind., 19.V.2015, leg. Ch. Makris (N.H.M.C.); Omalos plateau temporary pond, Lefka Ori (35.32470; 23.89060), 1 ind., 29.V.2015, leg. Ch. Makris (N.H.M.C.); Eastern plateau between Pyrgos and Mavres peaks, Omalos plateau (35.34060; 23.90830), 1 ind., 31.V.2015, leg. Ch. Makris (N.H.M.C.). Lassithi: Lassithi plateau (35.18290; 25.46230), 21.V.2018, leg. P. Brandl (Collection P.B.).

Distribution: Crete (Endemic).

I.U.C.N. (Europe): DD (Data Deficient)

This xylophagous species closely associated with *Acer* is reported from several localities along the island (Sláma 1985; Sláma and Slámova 1996; Schedl 2013). We expand this species' distribution mainly to the west around the Lefka Ori massif, but also in the east.

Tenebrionidae

Iphthiminus bellardi Truqui, 1857 (Fig. 2D)

New Records: Chania: Impros gorge (35.2110; 24.168600), 1 ind., 29.IV.2012, leg. M. Mylonas (N.H.M.C.); Melissitis stream (Lefka Ori) (35.36670; 23.9143), 1 ind., 19.I.2014, leg. K. Vardinoyannis (N.H.M.C.). Omalos plateau (Lefka Ori), inside a rotten *Cupressus* (35.3590; 23.9114), 1 ind., 1.X.2021, leg. G. Bolanakis (N.H.M.C.); Between Pefkias and Kyparissos peaks, Lefka Ori (35.35690; 23.86350), 1 ind., 31.V.2015, leg. C. Makris (N.H.M.C.); Psilo Kokkali peak (Lefka Ori) (35.3379; 23.8524), 1 ind., 31.V.2015, leg. C. Makris (N.H.M.C.). Niato plateau (Askyfou, Lefka Ori) (35.29528; 24.144997), 1 ind., 31.VII.2019, leg. G. Bolanakis (N.H.M.C.). Heraklion: Agios Yakynthos (Zominthos, Psiloritis) (35.257916; 24.856313), 1 ind., 24.V.2019, leg. G. Bolanakis (N.H.M.C.).

Distribution: Cyprus, Greece, Israel, Syria, Turkey.

I.U.C.N. (Europe): EN (Endangered)

Iphthiminus italicus was divided in three subspecies *I. italicus s.str.* Truqui, 1857, *I. italicus bellardi* Truqui, 1857 and *I. italicus croaticus* Truqui, 1857 (Aliquò et al. 2007). Among these, only *I. i. bellardi* occurs in Crete. The latest taxonomic catalogues regard these subspecies as good species, with an East Mediterranean distribution (Iwan et al. 2020). To our knowledge *I. bellardi* appears to be reported for the first time from Crete in Picka (1984), from the Omalos plateau. Here we expand its range in the south-eastern slopes of the Lefka Ori massif, as well as in the central part of the island, in the Psiloritis massif (Yakynthos site). Crete is the westernmost part of the *I. bellardi* distribution, and thus could rise as an important conservation site for the species. Our records clearly expand the EOO of the species in Crete adding a novel massif to the species' range.

Scarabaeidae

Cetonia asiatica Gory and Percheron, 1883 (Fig. 2E)

New Records: Chania: Tavri plateau, Lefka Ori, mountain shrubland with *Quercus coccifera*, *Acer* and *Crataegus* (35.30000; 24.16440), 1 ind., 16.V.2019, leg. G. Bolanakis (N.H.M.C.); same data, but 20.VI.2019; Niato plateau, Lefka Ori, mountain shrubland with *Quercus coccifera*, *Acer* and *Crataegus* (35.29530; 24.14500), 1 ind., 20.VI.2019, leg. G. Bolanakis (N.H.M.C.); Kydoni gorge, in a riparian site with *Platanus* trees (35.40280; 23.91140), 5 ind., 31.V.2018, leg. G. Bolanakis (N.H.M.C.); same data, but 18 ind., 16.V.2019; same data but, 1 ind., 20.VI.2019. Rethymnon: Rouvas forest, Psiloritis, in *Quercus coccifera* – *Platanus* forest by stream bank (35.16420; 24.91630), 19 ind., 4.IV.2019, leg. G. Bolanakis (N.H.M.C.); same data, but 1 ind., 24.V.2019; Petres gorge, in a stream bank with *Platanus* and *Quercus* (35.33650; 24.36020), 4 ind., 25.IV.2018, leg. G. Bolanakis (N.H.M.C.); same data, but 31.V.2018; same

data, but 3 ind., 12.IV.2019; Agios Yakynthos, Psiloritis (35.25790; 24.85630), 5 ind., 24.V.2019, leg. G. Bolanakis (N.H.M.C.); same data, but 15 ind., 2.VII.2019; Kastellos (35.3119; 24.4186), 8 ind., 12.IV.2019, leg. G. Bolanakis (N.H.M.C.); same data, but 2 ind., 31.V.2019; Koumi village (35.2936; 24.4503), 6 ind., 12.IV.2019, leg. G. Bolanakis (N.H.M.C.); Lochria village, in *Quercus coccifera* dehesa like forest (35.17640; 24.77780), 2 ind., 4.IV.2019, leg. G. Bolanakis (N.H.M.C.); same data, but 18 ind., 24.V.2019; same data, but 10 ind., 2.VII.2019; same data, but (35.1752; 24.7761), 1 ind., 4.VI.2019; same data, but 2.VII.2019; Omalos Viannou plateau, near a small doline with dehesa like forest of *Quercus coccifera* (35.068; 25.4719), 19 ind., 10.V.2019, leg. G. Bolanakis (N.H.M.C.); same data, but 11 ind., 12.VI.2019; Omalos Viannou plateau, dehesa like forest (35.068; 25.4487), 1 ind., 12.6.2019, leg. G. Bolanakis (N.H.M.C.). Lassithi: Katharo plateau, in *Quercus coccifera* forest (35.1535; 25.5859), 58 ind., 10.V.2019, leg. G. Bolanakis (N.H.M.C.).

Distribution: Crete (Endemic).

I.U.C.N. (Europe): Not Evaluated.

This species despite its name is endemic to Crete (Bezděk 2016). It is synonymous with two species described by Reitter, *C. oertzeni* (Reitter, 1885) and *C. scutellaris* (Reitter, 1891), but since this name is prior to the latter ones, *C. asiatica* remains the accepted name today (Mikšić 1982, Bezděk 2016). In his article Reitter (1891) refers to two different species of *Cetonia* in Crete. *C. scutellaris* and *C. valesiaca* (syn. *C. oertzeni*) but not *C. asiatica*. Reitter managed to correct himself in a following article (1896), where he clarifies that *C. valesiaca* is not present in Crete and the specimens from Crete treated in his work of 1891, belong to *C. asiatica*. Ultimately Reitter (1896) accepts two species of the genus *Cetonia* in Crete, *C. scutellaris* and *C. asiatica*, while today the former is considered a synonym of the latter (Bezděk 2016). We located several populations of this species during our research, from a variety of habitats. The species appears to be distributed throughout the island, but in contrast to another prominent cetoniid of Crete, *Protaetia opaca cretica* Kraatz (1880), it is clearly rarer and absent from urban environments. We managed to collect specimens that could be attributed to both of the two species accepted by Reitter (1896) in Crete. Perhaps thanks to the plethoric material collected and with the contribution of molecular data, a revision of the genus *Cetonia* on the island could unravel if Reitter was really insightful when he distinguished two "forms" of this genus in the island.

Buprestidae

Strigopteroides margotanae Novak, 1995 (Fig. 3A)

New records: Lassithi: Gra Lygia (35.014475; 25.693546), 1 ind., 23.VII.2023, leg. G. Bolanakis (N.H.M.C.).

Distribution: Crete (Endemic).

Strigopteroides margotanae is endemic to Crete, only known from Azogyres and Palaiochora in the south-western Crete (Mühle et al. 2000). Recently it was

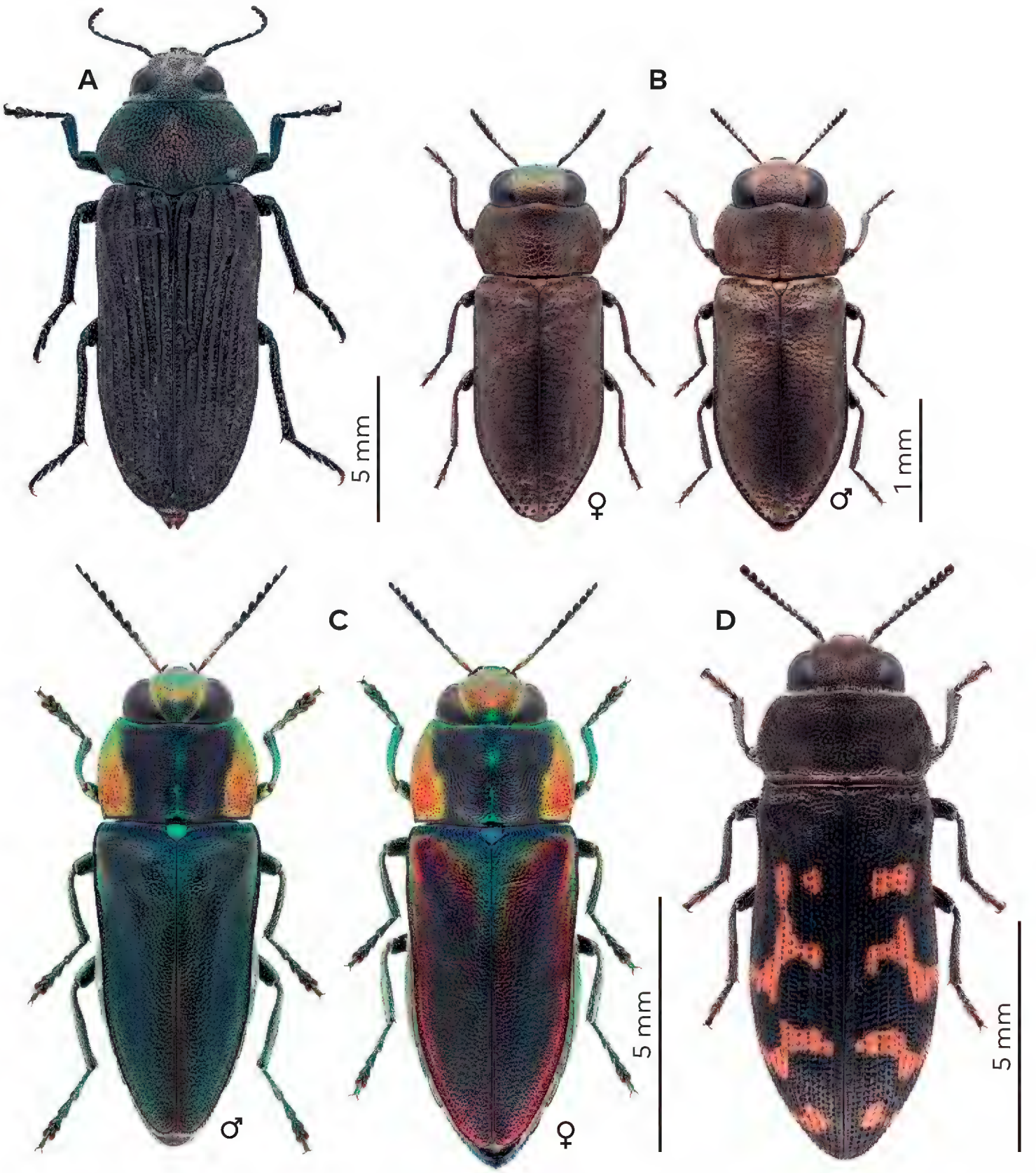

Figure 3. **A** *Strigopteroides margotanae*; **B** *Anthaxia schoenmanni*; **C** *Anthaxia ariadna*; **D** *Acmaeodera bartoni*.

reported near the Omalos plateau (Lefka Ori, Chania) (Samaritakis Fotis personal communication), also in western Crete. Here we expand the range of the species to south-eastern Crete, at Gra Lygia, Lassithi. It appears that the species has a wider distribution than expected, but its population seems to be severely fragmented, scattered through the island. More research is required, especially focused in the southern part of the island in order to unveil novel localities between the two geographical extremes (Palaiochora and Gra Lygia). Furthermore, the species'

host/s could also be a field for further research: initially, the species was only known from *Platanus*, while Samaritakis photographed it on dry bark of *Quercus coccifera* (personal communication 2022). In Gra Lygia the species was found dead, on a sandy coast, with no plane trees nearby.

Anthaxia schoenmanni Novak, 1984 (Fig. 3B)

New records: Chania: Between Pefkias and Kyparissos peaks, Lefka Ori (35.35690; 23.86350), 5 ind., 31.V.2015, leg. Ch. Makris (N.H.M.C.); Psilo Kokkali peak, Lefka Ori (35.33790; 23.85240), 5 ind., 31.V.2015, leg. Ch. Makris (N.H.M.C.).

Distribution: Crete (Endemic).

I.U.C.N. (Europe): Not evaluated.

A species distributed throughout Crete (Mühle et al. 2000). Here we add two new localities.

Anthaxia ariadna Bílý, 1982 (Fig. 3C)

New records: near Melidoni, Lefka Ori (35.38120; 24.11302), 5 ind., 19.V.2015, leg. Ch. Makris (*in situ* observation); Samaria gorge, Agios Nikolaos church (35.30690; 23.93620), 1 ind., 1.VI.2015, leg. Ch. Makris (N.H.M.C.)

Distribution: Crete (Endemic).

I.U.C.N. (Europe): Not Evaluated.

This species is restricted in west Crete, Lefka Ori massif. Here we report two new localities.

Acmaeodera bartoni Obebenger, 1940 (Fig. 3D)

New records: Chania: Volikas towards, Lefka Ori (35.38281; 24.06786), 1 ind., 21.V.2015, leg. Ch. Makris (N.H.M.C.); Kares to Ammoudari, Lefka Ori (35.30320; 24.18140), 3 ind., 23.V.2015, leg. Ch. Makris (N.H.M.C.); Krapi plateau, Lefka Ori (35.31360; 24.19970), 1 ind., 23.V.2015, leg. Ch. Makris (N.H.M.C.); Askyfou SW, Lefka Ori (35.27180; 24.17430), 1 ind., 23.V.2015, leg. Ch. Makris (N.H.M.C.); Anopoli to Pachnes, Lefka Ori (35.25080; 24.11080), 2 ind., 24.V.2015, leg. Ch. Makris (N.H.M.C.); Ammoudari to Tavri, Lefka Ori (35.29720; 24.17100), 1 ind., 27.V.2015, leg. Ch. Makris (N.H.M.C.); Krapi N, Lefka Ori (35.32900; 24.19860), 1 ind., 28.V.2015, leg. Ch. Makris (N.H.M.C.); Kares village E, Lefka Ori (35.29400; 24.18970), 2 ind., 28.V.2015, leg. Ch. Makris (N.H.M.C.); Ammoudari SW, Lefka Ori (35.29210; 24.17450), 1 ind., 28.V.2015, leg. Ch. Makris (N.H.M.C.); Samaria gorge, Agios Nikolaos church (35.30690; 23.93620), 1 ind., 1.VI.2015, leg. Ch. Makris (N.H.M.C.).

Distribution: Crete (Endemic).

I.U.C.N. (Europe): Not evaluated.

This species is distributed along Crete (Mühle et al. 2000). Here we expand its distribution mainly in the heart of the Lefka Ori massif. Our findings could indicate a montane preference. This was to be expected, as the species thrives in *Quercus* spp. and most oaks forests are found in mountains (Rackham and Moody 1996). In Lefka Ori the dominant *Quercus* species is that of *Q. coccifera* (kermes oak). It is plausible that *A. bartoni* prefers kermes oak, but further research is required to confirm it, especially in the lowlands of western Rethymno where other *Quercus* spp. are forming their largest populations (Rackham and Moody 1996).

C. Alien species

Steraspis squamosa Klug, 1829.

New records: Chania, Kalyves beach (35.451707; 24.178307), 1 ind., 11.VIII.2019, leg. M. Charalampakis, det. G. Bolanakis (*in situ* observation)

Distribution: Turano-African (see Kubáň 2016 for a detailed distribution).

I.U.C.N. (Europe): Not Evaluated.

This species although known from North Africa and Middle Asia, recently was reported for the first time in Europe , in Chania (Crete) (Bolanakis and Trichas 2018). Here we reconfirm the record of this species from the original locality with additional specimens, indicating an established population. The original two specimens were collected in 2017, while the new one was collected in 2019. Furthermore, we report this species from a novel location around Kalyves (Chania), significantly away from the original location (>20 km). This new record could indicate a wide distribution among the north coastline of Crete. Further investigation aiming specifically on old tamarisk groves (the species' host plant) could shed more light on the current distribution of *S. squamosa*. The best explanation of the species' presence in the island remains a human transport. The recent records from Kalyves, a beach area quite remote from the original location, indicate a fast-spreading ability on West Crete or multiple introductions, rendering *S. squamosa* a fresh newcomer on the island of Crete.

Conclusions

Despite the long-term entomological research that has been conducted almost uninterruptedly from the 19th century to the present day, Crete remains an island conducive to research, even in the most basic aspects of entomology, i.e. taxonomy and faunistics. This may be illustrated by the works of Assing (2019, 2022; Assing et al. 2019), during which a significant amount of Cretan endemic Staphylinidae were described for a first time during the last 10 years.

Saproxylic beetles are central to the conservation of beetles and nature in general. The presence of relict, ultra-specialised and/or engineer-type species involved in

the wood decomposition cycle makes them good indicators for diagnosing and monitoring sites. Here, we presented some novel records of saproxylic beetles on the island (with *Calais parreysii, Dorcus peyronis* and *Platypus cylindrus* being documented for the first time from Crete), contributing to the knowledge regarding their geographical, and in some cases, ecological range. From a conservation perspective, given the dominance of I.U.C.N.'s criterion B (based on the species range and biological specialisation) in invertebrates (Cardoso et al. 2011), the information regarding species distribution is of high value, especially in cases such as *Stictoleptura slamai* where we add three more massifs to the species' range. A conservation program aiming for the better understanding of the threat status of Cretan saproxylic Coleoptera could be an investment for new intensive faunistic research of Cretan forests, gorges and mountains. From a biogeographical perspective our findings contribute to a better understanding of Crete's saproxylic assemblages recovering the pine fragmentation, as well as some classical biogeographical barriers/zone such as a central-west distribution that ends in Psiloritis (*Isotomus speciosus jarmilae*). To sum up, our results could stimulate further research towards the Cretan saproxylic diversity, even though the island is not characterized by vast forests and woodlands.

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